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ABSTRACT

This paper is concerned with two questions derived from Piaget and Inhelder's (1973) work on the relationship between memory and the developing intelligence of the child. First, can children retain operatively advanced information through the use of a non-operative mnemonic? Secondly, can the salience of operative versus non-operative information be manipulated through story context? To test the first question, grade one children were provided with a picture representing the concept of horizontality as embodied in the water level of a container. Within the context of a story, children were told it was important to remember the particular horizontal orientation of the water level. Two types of memory aids were provided. Half of the children were given a brief description and demonstration of how the water level of a container remains parallel to the supporting surface (an operative explanation). The remaining childre were given a simple mnemonic strategy: it was pointed out that the belt of a woman (depicted in the picture) and the water level were perfectly aligned (the figurative solution). A second question investigated whether memory for figurative information could be improved with the provision of contextual background. A figurative and an operative context were provided for the operative concept of seriation as depicted by a clothesline of clothes. Memory for the seriation frame was tested by asking the child to recall the colour of the clothes and to reconstruct their arrangement using small cutouts. The results confirmed the hypothesized effects (Author/SS)

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Context Effects on Children's Memory of Piagetian Concepts

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Abstract

Two aspects of the Piagetian approach to memory were examined. First, can children retain operatively advanced information through the use of a non-operative mnemonic. Secondly, can the salience of operative versus non-operative information be manipulated through story context. The results which confirmed both of the above expectations were discussed in terms of Piaget's theory.

Context effects on children's memory of Piagetian concepts

The present paper is concerned with two questions derived from Piaget and Inhelder's (1973) work on the relationship between memory and the developing intelligence of the child. The first question concerns the problem of memory regression. The regression issue has been highlighted by researchers involved in attempted replications of the memory improvement phenomenon reported by Piaget and Inhelder. In one of their most cited studies, 74% of children ranging in age from four to seven were found to have better memories seven months after seeing a simple seriation array than they had at a one week retention interval. Piaget and Inhelder argued that the memory improvements reflected the development of the children's underlying operative schemes. The results thus supported their theoretical notion that figurative processes such as memory and imagery are derived from and embedded in operative structures.

Considerable controversy surrounds the memory improvement phenomenon. One problem is the often high incidence of memory regressions found in research (Dahlem, 1969; Furth, Ross, & Youniss, 1974; Liben, 1974, 1975; Maurer, Siegel, Lewis, Kristofferson, Barnes & Levy, 1979; Samuels, 1976). Children do appear to be able to retain operatively advanced information for short periods of time with regression, that is memory loss, evident at longer retention intervals. While deterioration is the sine qua non in most accounts of memory, these regressions are problematic for Piaget's theory. If operative structures either remain stable or develop with time, then presumably operative-based memories should show either stability or improvement, but not regression. Furth, Ross, and Youniss (1974) have offered the following explanation. They proposed that the initial memories are supported by a memory trace which enables the children to reproduce operatively advanced information. This trace fades with time, however, to be

replaced by memories reconstructed from the child's immature operative understanding. The unsatisfying feature of this explanation is that it awkwardly juxtaposes a trace account of memory with a reconstructive view.

An explanation more congenial to a Piagetian account is that children are able to remember operative information by a variety of alternative schemes. While assimilation to operative schemes may provide the stablest long-term memory, children may be able to structure material by resorting to mnemonic or figurative means. The present research provides some preliminary data relating to this suggestion. Grade one children were provided with a picture representing the concept of horizontality as embodied in the water level of a container. This is illustrated in Figure 1.

Insert Figure 1 about here

This concept was selected as it is one which most children in the age range employed would have only a transitional understanding. Within the context of a story, children were told it was important to remember the particular horizontal orientation of the water level. To help them remember they were given two types of memory aids. Half of the children were given a brief description and demonstration of how the water level of a container remains parallel to the supporting surface. For the remaining children, the experimenter provided a direct mnemonic. It was simply pointed out to each child that the woman's belt and the water level were perfectly aligned. In other words, in one group children were provided with an "operative" explanation, while in the other group a "figurative" mnemonic was given.

The second question addressed in this study concerned children's memory for figurative or arbitrary details of a picture, such as colours, in contrast to memory for the more conceptual or operative information, the latter being

Piaget's primary concern. Our own previous research (Martin & Yuille, Note 1) comparing operative and figurative memory has shown that the pattern of retention differs from that found for memory for operative information. For example, memory for figurative details was unaffected by the operative complexity of a picture. Also, figurative memory demonstrated more pronounced test-retest effects and declined more dramatically over time than operative memory. These findings coincide with those reported by Voyat (reported in Piaget and Inhelder, 1973) and Liben (1974) showing that memory for figurative details is short-lived and manifests little or no improvement with age,unlike recall of operative information. The specific question explored in the present study was whether the use of varying story context could affect this pattern of results. In particular, we wished to determine whether children could demonstrate good recall for colour information if provided with an appropriate context. To demonstrate this, the operative concept of seriation was selected, depicted as a clothesline of clothes of one colour (see Figure 2). Two story contexts were then generated emphasizing either the seriated arrangement of the clothes or their colour.

Insert Figure 2 about here

Method

Twenty-five Grade One children were seen individually and read a story which was illustrated by a series of picture frames. One of the picture frames included the horizontality concept, as in Figure 1, and a second picture frame included the seriation concept, as in Figure 2. The particular story read to each child provided either the operative demonstration or mnemonic for the horizontality frame and either the figurative or operative context for the seriation frame. Aside from these manipulations, the details of the story read to each child were identical.

Two weeks after presentation of the story and the accompanying pictures, each child was seen again individually for a memory test. First the child was asked to recall the story. To assist them they were presented with the same sequence of pictures they had seen earlier, reduced in size and glued to a board. Both the water level in the horizontality frame and the clothes from the seriation frame were eliminated. During recall the child was asked if he/she remembered how the water level had looked. He/she was then asked to draw in the omitted water level. This was followed by a recognition task consisting of four alternatives, one of which reproduced the correct, originally seen horizontal orientation. Memory for the seriation frame was tested by asking the child to recall the colour of the clothes and to reconstruct their arrangement using small cutouts provided by the experimenter.

Results

The results were as follows. As can be seen in Table 1, 57% of the children given the direct mnemonic remembered an accurately oriented water level while only 9% of the children given the operative explanation gave an accurate response. The recognition results showed the same pattern although with a reduced difference between the two groups.

Insert Table 1 about here

Results for the seriation versus colour manipulation are found in Table 2. Of the children who heard a colour salient context, 93% accurately remembered the colour while only 9% of the children given the seriation context gave an accurate colour response. The memory results for the seriation information were not as striking. Of the children in the seriation context condition, 45% accurately reconstructed the arrangement of the clothes whereas only 21% of the children in the colour salient manipulation gave an accurate reconstruction.

Insert Table 2 about here

Discussion

The results for the seriation versus colour manipulation suggest that memory for arbitrary figurative information does not have to be poor or short-lived when supported by a meaningful context, in this case a story. Information for a figurative detail like colour can be excellent, at least up to two weeks. Previous findings of poor memory for figurative details may reflect the lack of an appropriate context as well as the fact that information such as colour is often not that salient in terms of "understanding" and remembering the meaning of an event.

As an aside, it should be noted that memory for the seriation information was tested in the group given a colour-relevant context in what amounts to an incidental memory test. Unlike previous research, the children in this group were not specifically instructed to remember the seriated array. The present results suggest that the seriation concept expressed pictorially may not be that salient to children. The question can be raised whether the type of stimuli and events used by Piaget and Piagetian memory researchers are accurate reflections of what children normally remember and code about the world around them.

The mnemonic employed with the horizontality concept seems rather trite, yet the results suggest that it can allow children to maintain operatively advanced information for a period of at least two weeks. While it appears unlikely that children naturally generate such mnemonics or that they have done so in previous research showing memory regressions, these results do demonstrate that so-called operative concepts can be figuratively reconstructed without assimilation to a Piagetian scheme.

Two additional points can be made. First, however, children retain information over the short or long term, it does not seem necessary to abandon a reconstructive perspective and to posit the existence of trace dependent memories. Instead, the basis for reconstruction could be broadened with memories reconstructed from more than just operative schemes. Secondly, while regression may represent at first glance an awkward finding for Piagetian theory, it is our contention that regression is entirely consistent with that theory. According to Piaget, disequilibrium is one of the most important causes of development, that is, the dialectical conflict between the child's present stage of understanding and the external world to which he accommodates. Presumably, the retention of operatively advanced information even for short periods of time would be important for fostering and providing a stage for such disequilibrating experience.

Reference Notes

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Table 1

Percentage of correct horizontality responses

Condition	Memory Response	
	Reproduction	Recognition
Operative Demonstration (n = 11)	9	20
Figurative Mnemonic (n = 14)	57	36

Table 2

Percentage of correct colour responses and seriation constructions as a function of story context condition

Condition	Colour responses	Seriation Reconstructions
Colour Salient Context (n = 14)	93	21
Seriation Salient Context (n = 11)	9	45

Figure 1. Horizontality Frame

Figure 2. Seriation Frame